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REPORT OF CHIEF OF BUREAU OF BIOLOGICAL SURVEY.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF BIOLOGICAL SURVEY,
Washington, D. C., August 31, 1916.

SIR: I have the honor to submit herewith a report on the work of the Bureau of Biological Survey for the fiscal year ended June 30, 1916.

Respectfully,

HENRY W. HENSHAW,
Chief, Biological Survey.

Hon. D. F. HOUSTON,
Secretary of Agriculture.

WORK OF THE BUREAU OF BIOLOGICAL SURVEY.

The work of the Bureau of Biological Survey is conducted along five principal lines: (1) Investigations of the food habits of North American birds and mammals in relation to agriculture, in charge of Dr. A. K. Fisher; (2) biological investigations with special reference to the geographic distribution of native animals and plants, in charge of E. W. Nelson; (3) supervision of national bird and mammal reservations, and the preservation of native wild game, in charge of Dr. T. S. Palmer; (4) enforcement of the Lacey Act regulating the importation of birds and interstate shipment of game, in charge of W. F. Bancroft; (5) administration of the Federal migratory-bird law, in charge of George A. Lawyer.

ECONOMIC INVESTIGATIONS.

PREDATORY ANIMAL CONTROL.

On July 1, 1915, an appropriation of \$125,000 became available for use on national forests and the public domain for destroying wolves, coyotes, and other predatory animals. Immediate steps were taken to organize the work on a permanent basis and eight districts were established: (1) Arizona and New Mexico; (2) California and Nevada; (3) Oregon and Washington; (4) Colorado; (5) Idaho; (6) Montana; (7) Utah; and (8) Wyoming. An inspector was placed in charge of each district and an inspector at large has supervision of all field work. Hunters were employed who devote their entire time to the work. They are not permitted to receive bounties from any source, and the skins of all fur-bearing animals taken by them become the property of the Government. A considerable

number of skins secured were retained for museum specimens, the remainder being sold and the proceeds turned into the Treasury.

Three methods of destroying predatory animals have been adopted—shooting, trapping, and poisoning. By the last method the bodies of the animals usually are not recovered, but the results accomplished have been very satisfactory.

During the year 424 wolves, 9 mountain lions, 11,890 coyotes, 1,564 bobcats, and 2,086 miscellaneous wild animals were destroyed. This includes those destroyed under the project for the suppression of rabies among wild animals, an appropriation for which became available March 4, 1916. It does not, however, take into consideration animals poisoned unless the bodies were recovered.

Demonstrations and experiments also were carried on in localities other than on national forests and public lands where predatory animals are causing great losses of live stock. The capture of wild animals in such localities is attended with much difficulty, as they become wary when constantly hunted.

RABIES AMONG WILD ANIMALS.

The project for the suppression of rabies among wild animals, provided for by an emergency appropriation on March 4, 1916, is carried on under the same supervision, organization, and methods that obtain in the predatory-animal control. This work was made necessary by reason of the alarming increase of rabies among wild animals, particularly coyotes, with resulting danger to human beings and loss of live stock. The infested area embraces southeastern Oregon, northeastern California, northern Nevada, and southwestern Idaho. Work was carried on also along the western border of Utah in order to prevent the spread of the disease to that State.

The seriousness of the outbreak will be realized when it is stated that more than 60 persons were treated by State authorities of Nevada during the year on account of exposure to rabies, such persons having been bitten by either wild or domestic animals. The loss of live stock has been very heavy. In a feed lot at Winnemucca a single rabid coyote caused the loss of 27 steers.

It is believed that the vigorous campaign now being carried on will prevent the further spread of the disease, and that within a reasonable time it can be suppressed over the greater part, if not all, of the areas where it now exists.

GROUND SQUIRRELS.

The extermination of ground squirrels from approximately 208,950 acres of Government land was accomplished during the past fiscal year. Of this area about 36,400 acres are on the Fort Totten Indian Reservation of North Dakota, and the remainder on the Modoc, California, and Sequoia National Forests and a few other smaller areas of Government land in California.

The ground squirrel extermination campaign in North Dakota, in cooperation with the State experiment station, is proving very successful, and has involved the use of the enormous quantity of five-eighths of a ton of strychnine in the northern part of the State and the systematic covering with poison of seven counties.

JACK RABBITS.

Demonstrations were held and campaigns organized during the winter to combat jack rabbits in infested farming communities of southern Idaho, central and eastern Oregon, southwestern Utah, northern Nevada, western Texas, and in smaller areas in California. Snowshoe rabbit repression was also undertaken on the Manti National Forest of Utah. Weather conditions were favorable for successful poisoning operations and a great number of these very destructive pests were thus disposed of. Many communities were organized for systematic campaigns for the coming winter.

PRAIRIE-DOGS.

Prairie-dog repression has been carried on with exceptional vigor, and the areas freed of this pest on National Forests and other public domain during the past fiscal year were more than double the total area of previous years. From July 1 to the end of the season 1915, heavily infested Government land had been poisoned to the extent of 886,429 acres, and 164,755 acres previously poisoned had been gone over a second time. From the opening of the poisoning season in April to June 30, approximately 470,000 acres were treated, making a total of 1,356,429 acres of Government land covered during the fiscal year. Of this area 504,393 acres are public lands of eastern Wyoming and southwestern South Dakota, and the remainder is on National Forests in Arizona, New Mexico, Colorado, and Montana, including the Crow Indian Reservation of Montana. The cost of this work varies from 1 to 2 cents an acre in the more lightly infested areas, from 6 to 8 cents an acre where the prairie-dog holes run from 10 to 20 to the acre, or an average of 5 cents an acre. The efficiency of the poison used has averaged from 85 to 90 per cent for one application. Mortality following the use of the poison in the northern States has been much higher, however, being placed at 98 per cent after a careful examination of the areas covered on the Custer National Forest and the Crow Indian Reservation of Montana.

POCKET GOPHERS.

During the fall, 5,390 acres of very heavily infested areas of fine grazing lands were cleared of pocket gophers on the Ochoco National Forest of Oregon, and also 1,280 acres on the Sequoia and 1,100 acres on the Tahoe National Forest of California. Methods of controlling this pest were demonstrated among farming communities in Tulare County, Cal.; in the Rio Grande Valley, Tex.; and in the Mescalero Apache Indian Reservation, N. Mex.

LAND CRABS.

Experiments to determine economic methods of controlling land crabs were conducted in the vicinity of Cocoanut Grove, Fla. These pests were estimated to have destroyed 60 per cent of the tomato plants of the locality, as well as quantities of other garden truck. They also damage coconut groves by their numerous burrows. It was found that the crabs could be exterminated by introducing 5

or 6 drops of carbon bisulphide into each burrow by means of a long-nozzled oil can and closing the opening by pressure of the foot.

SEED-EATING RODENTS.

Extermination of rodents which destroy seeds and nursery stock on areas that are being reforested has been completed on the Black Hills National Forest of South Dakota and the Florida National Forest of Florida, and experiments have been conducted on the above planting areas and on the Converse Experiment Station of California. Improved methods for controlling pine mice, wood rats, and other seed-eating rodents have been discovered.

FUR-BEARING ANIMALS.

Investigations of the behavior and requirements of minks and martens in confinement have been continued at Linden, Md., and the National Zoological Park, D. C. Inexpensive types of pens have been devised which are proving very satisfactory. Effects of rations differing in composition and amount have been studied in relation to breeding, fur production, and general health. An understanding of the symptoms and causes of the common ailments of these animals has been gained, and remedial or preventive measures have been adopted. The results attained with these animals and the numerous requests for advice about fur farming have prompted the establishment of an experimental fur farm in northern New York, under conditions favorable to the production of high-grade fur and to the development of practical fur farming. Here experiments may be undertaken on a much larger scale than has hitherto been attempted. It is expected that, ultimately, many kinds of fur animals, foreign as well as native, will be tested as to their adaptability to domestication. One of the most important lines of work to be taken up will be that of developing improved strains by selective breeding. Yards, pens, an ice house, and a storehouse are being erected and soon will be ready for use.

An assistant spent the summer of 1915 in Alaska investigating the present status there of fur farming, and the special needs of those engaged in it. It appears that upward of 100 Alaskans are directly interested in the domestication of fur animals. In 35 localities there are silver-fox yards, and on an equal number of islands blue foxes are farmed. The silver-fox farms are not yet producing fur, but pelts sent to market this season from the older blue-fox farms brought gratifying returns.

During the year two bulletins concerning fur-bearing animals were published, one being a summary of laws in the United States and Canada relating to trapping, protection, propagation, and bounties; and the other a bulletin on silver-fox farming.

FOOD HABITS OF THE THRUSHES.

A report on the thrushes, completed and published during the year, shows that the economic tendencies of these birds are in keeping with their other desirable qualities. The 6 species discussed are found to commit no depredations on crops, but to destroy large numbers of insects, including some that are very injurious.

BIRDS OF PORTO RICO.

During the year a report on the birds of Porto Rico was issued. The work upon which this is based was done at the request of and in cooperation with the Porto Rican Department of Agriculture. The treatise is the most comprehensive on the economic value of birds ever issued for any locality in tropical America, and is one of the most important local bird studies ever made. One hundred and sixty-two species of birds are known to occur in Porto Rico, and the report gives data on the food habits of about 100 of them. In most cases the economic treatment is detailed, and it is shown that a number of the island birds are enemies of the most serious pests of Porto Rican agriculture. Thus 21 species were found to feed upon the changa, or mole cricket, 17 on the cane root-borer, 6 on the stalk-borer, and 6 on the May beetle, all of which are pests of sugar cane.

WILD-DUCK FOODS.

The bureau has published three bulletins dealing with the value and methods of propagation of more than 60 kinds of important wild-duck foods. The information thus furnished has been widely used and is in great demand. A revision of the first two publications on the subject has been prepared, as they are out of print. Much additional information has been included in the revision regarding the plants originally treated, and 40 others are recommended with the view of stimulating dealers to add them to their stocks.

THE INTRODUCED STARLING.

The European starling, long since introduced into the United States, has only recently greatly extended its range. The species is hardy and efficient and well equipped for the struggle for existence. The increase of the bird and its spread into new districts have emphasized the need of an investigation of its economic standing. For some time information has been sought by correspondence and by laboratory examination of stomach contents, and at the present time two assistants are studying the bird's habits in the field. A report on the result of the investigations is planned for the coming fiscal year.

THE CROW.

In an article on "Winter Crow Roosts," published in the Yearbook for 1915, the roosting phase of crow life was fully described and the economic significance of crow roosts discussed. An extensive report on the relation of crows to man was completed. The essential conclusions are that crows are about equally beneficial and injurious, and that they are so wary and sagacious as not to need legal protection. Lack of this, while not endangering the species, will permit farmers to protect their crops or other property whenever necessary.

BIRDS OF THE SOUTHEASTERN STATES.

In response to an urgent need for information on the subject, a Farmers' Bulletin on common birds of southeastern United States has been prepared. It shows that every important insect pest of the South has its bird enemies, large numbers of the corn-leaf beetle, the

green bug, the billbug, the boll worm, the cotton worm, and the cotton-boll weevil being destroyed by hungry birds. No fewer than 66 kinds of birds are now known to eat the boll weevil. On the 100 acres in grain on a single southern farm, birds were found to be destroying approximately a million green bugs daily.

ECONOMIC STATUS OF VARIOUS OTHER BIRDS.

Examination of bird stomachs by groups was completed for two species of crossbills, two of redpolls, the pine grosbeak, the evening grosbeak, three species of godwits, three of curlews, the avocet, the chewink, the scarlet tanager, and the red-eyed vireo. Examinations were brought up to date for the green-winged and blue-winged teals, 7 species of swallows, the wrens, thrashers, and mockers, the creeper, 4 species of nuthatches, 8 species of titmice and chickadees, the wren-tit, starling, fish crow, ravens, and about 13 species of owls.

Swallows as valuable native birds; an index to papers on the food of birds, written by members of the Biological Survey; the food of wild ducks in the sandhill region of Nebraska; methods of attracting birds in northwestern United States; and the care of canaries, are subjects of additional manuscripts, based on this work, which have been prepared for publication.

MORTALITY AMONG WILD DUCKS IN UTAH.

Investigations into the causes of death of large numbers of wild ducks and other waterfowl around Great Salt Lake, Utah, were continued during the field season of 1915. Because of a light fall of snow in the mountain ranges surrounding Salt Lake Valley during the previous winter, water in the streams tributary to Great Salt Lake was very low. In consequence large areas of marsh that in normal years harbor immense numbers of wild ducks were entirely dry and the birds resorted elsewhere. For this reason fewer ducks died during 1915 than in previous years, but still the mortality was enough to be of importance.

In conducting the investigations, an assistant worked in Salt Lake Valley from May until October. Experiments and observations begun last year were carried on mainly in the great marsh areas at the mouth of Bear River. Methods of practical value for the treatment and cure of sick birds by placing them in fresh water were devised that will prove useful in future outbreaks. Though it seems evident that the large number of birds that die suffer from poison apparently due to an alkali absorbed from stagnant water, it was found that many of the affected individuals suffered from lead poisoning as the result of swallowing the lead shot present in large quantities about the shooting stations and blinds. Late in fall, reports were received of many sick ducks at Lake Bowdoin, Mont., and an assistant engaged in the work visited this locality in October in order to study local conditions.

BIOLOGICAL INVESTIGATIONS.

As in previous years, biological investigations have been conducted mainly along lines essential to the effective administration of various other activities of the bureau, including the Federal migratory-bird law; the enforcement of the Lacey Act, regulating importations and

interstate shipments of birds; the maintenance of bird and mammal reservations; and the economic investigations concerning the relations of birds and mammals to agriculture, stock raising, and forestry. The various card indexes containing information in regard to the distribution and habits of the various species of North American birds and mammals, comprising a vast amount of unpublished data gathered by field parties of the bureau as well as information gleaned from published sources, have been very largely increased during the year. These sources of information become increasingly valuable with growth.

DISTRIBUTION AND MIGRATION OF BIRDS.

Reports on the migration of birds were received, as in past years, from more than 300 volunteer observers located in all parts of the United States, in addition to a considerable number from Alaska and Canada. Notable progress was made in mapping the exact distribution of the various species of birds inhabiting North America, and for this work the reports from volunteer observers have been extensively drawn upon. A report on the distribution and migration of gulls was published; a similar report on the terns was prepared, as well as a revised edition of the report on ducks, geese, and swans, in which new information was incorporated; and one on the grebes, loons, and auks was nearly completed.

BIRD ENUMERATIONS.

The results of the second bird count taken in the early summer of 1915 by more than 200 voluntary observers were studied and a report was prepared for publication. The third count taken in the summer of 1916 by about the same number of observers has not yet been critically studied, since the returns are not all in, but as far as can be determined it bears out the conclusions reached from a study of the work of 1915—that where birds are protected there is a marked increase in their numbers, and that intelligent and systematic encouragement, therefore, may be expected to result in a notable increase in the bird population throughout the country, with corresponding benefit to the farmer.

BIOLOGICAL SURVEYS.

Progress was made on the biological surveys of Oregon and Arizona, and work on Montana was begun. A survey of Alabama was nearly completed and a report on the birds of that State prepared for publication. Field work on the survey of North Dakota was finished. A report on the life zones of Wyoming was completed and one on the mammals of that State was well advanced in preparation. Reports on the mammals and birds of New Mexico and on the birds of Texas were practically completed. In the spring of 1916 preliminary studies of the distribution of birds and mammals in parts of Georgia, and North and South Carolina were made.

INVESTIGATIONS RELATING TO MIGRATORY WILD FOWL.

In the summer of 1915 field studies were made on the abundance and distribution of breeding waterfowl in Nebraska, in connection with a special investigation of the food plants of these birds.

Reports embodying the results of these investigations are nearly ready for publication. An investigation of the breeding and distribution of waterfowl in North and South Carolina and Georgia was made in the summer of 1915. Field investigations on the abundance and distribution of waterfowl in their winter homes were carried on in Alabama in the autumn of 1915 and an investigation of the distribution of breeding waterfowl of North Dakota was begun early in the summer of 1916.

STUDIES OF ELK IN YELLOWSTONE NATIONAL PARK.

In cooperation with the Forest Service, an investigation of the condition of the elk herds in the region of Yellowstone National Park was instituted for the purpose of providing for their future welfare. The summer and winter ranges in that region were examined in order to ascertain the areas necessary to be reserved for the use of the animals. Early in the spring of 1916 a cooperative count of the elk of that region was made, which showed that the southern herd contained about the same number as had been previously reported (approximately 18,000). The northern herd is shown to contain only about a third of the number it was supposed to hold. This investigation is important, since the increased occupation of the western ranges by cattle and sheep renders it imperative that if the game herds are to be preserved provision for their protection be made in advance. The majority of all the elk left in the United States are concentrated in and about Yellowstone National Park and this reservoir for restocking other areas is too important to be neglected.

TECHNICAL INVESTIGATIONS.

A large number of specimens of birds and mammals were identified at the request of State and other institutions and of individuals. Technical revisions of the American moles, the pocket gophers, and the prairie-dogs were published as North American Faunas, and revisions of the flying squirrels, rice rats, and grizzly and big brown bears were prepared for publication. These studies involved the examination and identification of large numbers of specimens, including, in addition to the collections of the Biological Survey and the United States National Museum, much additional material borrowed from other museums.

Besides the technical studies of mammals prepared for publication, many data of this character are embodied in manuscript maps illustrating the distribution of mammals. These show in graphic form the area inhabited by practically every species of North American mammal. Much work in correcting and amplifying these maps has been accomplished during the year.

GAME PRESERVATION.

RESERVATIONS.

The Biological Survey is charged with the maintenance of 72 reservations, 5 of which are big-game preserves and 67 bird reservations. The mammal reservations include the Montana Bison Range, the Wind Cave Game Preserve in South Dakota, the Niobrara Reser-

vation in Nebraska, the Elk Refuge in Wyoming, and the Sullys Hill Game Preserve in North Dakota. The Niobrara Reservation was intended as a bird reserve, but has been stocked with big game and is at present maintained chiefly for buffalo and elk. In the first three reservations above mentioned the herds of buffalo have shown a notable increase since their establishment a few years ago, and now include 207 head, or more than a third of all the buffalo which now belong to the Government. The elk number about 159 and the antelope 40, making a total of about 400 head of big game.

GAME PRESERVES.

MONTANA BISON RANGE, MONT.—The herd of buffalo is in very satisfactory condition. With the addition of 24 calves (14 males and 10 females), born this year, and the loss of 1 bull, the total number is now 165, of which 79 are bulls and 86 cows, an increase of more than 400 per cent since the herd was placed on the range in 1909. The herd of elk has been increased by the addition of 26 transferred from Yellowstone National Park in February, and now numbers about 65. The number of antelope was increased by a donation of 3 animals by a citizen of Deer Lodge, Mont., and 1 female by the Oregon Fish and Game Commission, and numbered 26, including the fawns of this spring.

WIND CAVE NATIONAL GAME PRESERVE, S. DAK.—At the beginning of the year there were 40 head of big game in the preserve, including 16 buffalo (6 bulls and 10 cows), 9 antelope, 14 elk, and 1 deer. Since that date the number has nearly doubled by births, and other additions to the herd. The births include 6 buffalo calves, 23 elk, and 9 antelope. Twenty-five elk were transferred from Yellowstone Park in February and 6 buffalo in June. The losses during the year included 4 antelope—2 adults and 2 fawns. The number of animals now on the reservation includes 28 buffalo, 62 elk, and 14 antelope, making a total of 104.

An important improvement has been made in clearing a fireguard 2 rods wide along the fence on the west side of the reservation, and efforts have been made to render the inclosure coyote proof by filling in with rock all the low places under the fence. The buildings and fences are in good condition and except for the losses in the band of antelope the outlook for the preserve is very encouraging.

WYOMING ELK REFUGE.—Purchase of a 520-acre tract mentioned in the last annual report has been completed, and application made to the Department of the Interior for the addition of 160 acres of public land under the terms of the act of March 4, 1913. This addition will make the total area of the elk refuge 2,760 acres. Improvements made during the year include the construction of about 2 miles of fencing. Hay harvested in the autumn of 1915 amounted to nearly 500 tons and most of it was used in feeding the elk. The winter was rather severe and feeding began on January 12 and continued until March 27. At one time in January there were about 3,000 head of elk on the reserve. A number of deaths, chiefly confined to calves, occurred among the elk both on the reservation and other points in Jackson Hole. The number of calves which died on the refuge was 208, or less than 1 per cent of the total fed. Many elk seemed to suffer from some obscure digestive trouble of which no satisfactory diagnosis was made. Some reports attributed the cause of death to feed-

ing musty hay, either old hay, or hay which had been put up during wet weather, but observations on the refuge did not support this theory and the real cause remains uncertain.

NIORARA RESERVATION, NEBR.—At the beginning of the year the herd included 11 buffalo, 28 elk, and 2 deer. During the winter 4 of the elk died. With the addition of 3 buffalo and 8 elk calves, the herd now numbers 14 buffalo, 32 elk, and 2 deer, or a total of 48 head.

The herd has practically reached the limit of the present inclosure, and, beginning December 15, feeding became necessary in severe weather, as the grass had been eaten off during the summer. The hay is cut on the reservation by the warden, and the expense of feeding is thus practically nominal.

SULLYS HILL GAME PRESERVE, N. DAK.—Under the additional appropriation of \$5,000 for the improvement of the game preserve in Sullys Hill National Park, N. Dak., a new contract was let for the construction of an 88-inch woven-wire fence some 6 miles in length for the inclosure in the park, the contractors having found it impossible to proceed under the first contract. New bids were called for and a contract let for the construction of the fence at a price somewhat less than the appropriation now available. Under this contract the ground was cleared along the line of the fence during the winter and the work of construction taken up as soon as conditions in spring permitted. Plans for next year will include building the necessary headquarters, barns, and buildings, and stocking the reservation with a herd of elk and other big game.

TRANSFER OF GAME.

Owing to severe weather and the necessity of concentrating attention on the feeding of elk, no effort was made to transport any animals from Jackson Hole this season. Through cooperation of the Department of the Interior and the Forest Service 100 head of elk were transferred from Yellowstone National Park. Fifty of these were placed on national forests in Colorado: 25 on the Wind Cave National Park, S. Dak.; and 25 were shipped to the Montana Bison Range. Six buffalo also were transferred from Yellowstone Park to Wind Cave Park in June.

NATIONAL BIRD RESERVATIONS.

The number of bird reservations was increased during the year by the addition of the Big Lake Reservation in Arkansas, established under Executive order of August 2, 1915. This makes 70 reservations established to date. Of these the Pribilof Reservation, Alaska, has been transferred by act of Congress to the Bureau of Fisheries, in the Department of Commerce; the Blackbeard Island Reservation has been abandoned as a national reservation and leased to the State of Georgia, and the Niobrara Reservation thus far utilized chiefly for big game, leaving 67 reservations maintained primarily for birds.

Under the limited appropriation available for maintenance of reservations, warden service for longer or shorter periods of time has been provided by the Bureau of Biological Survey for about a third of the reservations. Through cooperation of the Reclamation and Forest Services, protection has been afforded birds on about as

many more of the reservations which are located on reclamation projects or in national forests. The Lighthouse Service has cooperated in protecting the Siskiwit and Huron Islands Reservations in Michigan, and the Smith Island Reservation in Washington; and the Coast Guard Service, of the Treasury Department, and the Navy Department have cooperated in guarding the Hawaiian Islands Reservation. About 20 reservations are at present without warden service of any kind, but half of these are so remote or difficult of access that there is comparatively little danger of the birds being molested. Of the others, warden service is urgently needed on Big Lake, Ark.; Aleutian Islands, Alaska; East Timbalier, La.; and on the Hawaiian Islands.

Several projects for draining lands in the vicinity of the Klamath and Malheur Reservations in Oregon and the Big Lake Reservation in Arkansas, as well as projects of similar kind for draining private lands in various parts of the country, emphasize the importance and necessity of retaining as breeding grounds for waterfowl and other birds tracts of land which are not especially valuable for agricultural purposes. Only in this way can proper provision be made for the maintenance and increase of an adequate supply of waterfowl. The area of marsh land necessary for breeding grounds is insignificant in comparison with the area over which the birds will spread during their migration and the benefits which will accrue to States and the general public through the increase of this important element in our supply of game birds.

KLAMATH LAKE, OREG.—Conditions on the reservation are somewhat unsatisfactory, owing to the uncertainty as to various plans for draining the lands on the Klamath Reclamation Project. Construction of a railroad embankment several years ago has increased the difficulty of patrolling the reservation, but has also made it difficult for boats to reach the lower part of the lake, and consequently the birds are less disturbed during the breeding season. In October a tule fire burned over a large area in the southwestern part of the reservation, destroying many minks and driving out the birds. This fire also burned fences and damaged pasture lands on several neighboring private holdings. Since the elimination of lands in 1915, a number of applications have been made for permits to file homestead entries within the reservation, but all have been rejected, both by the local office and, on appeal, by the General Land Office.

LAKE MALHEUR, OREG.—The usual large number of waterfowl and shorebirds bred on the reservation during the past season and 4,635 muskrats and 17 minks were trapped during the open season in fall and early winter. A recent report indicates that many muskrats were frozen to death during severe weather late in the winter. Several well-defined movements have been set on foot at various times to drain Malheur Lake and throw the land thus reclaimed open to settlement. One of the latest plans is to shut off the water now flowing into the lake through Blitzen and Silvie Rivers and deepen the outlet to Harney Lake. Malheur Lake is very shallow and 12 feet higher than Harney, and by deepening the channel its waters would drain into Harney Lake and much of the surrounding marsh and tule land be reclaimed. No actual work on this project has yet been undertaken.

SMITH ISLAND, WASH.—The value of this reservation as a refuge for waterfowl has been clearly demonstrated during the past winter. Several species of ducks, notably widgeons, occurred about the reservation in such numbers as to cause complaints of damage to clover fields in the vicinity. An inspector sent to investigate the matter ascertained after careful examination that the damage was local and by no means serious. Application was made to the Department of Commerce for permission to use the lighthouse reservation as a basis for operations for gathering kelp in the vicinity of the island. These operations will be confined to three months during the summer, and in the permit which has been issued provision has been made for protection of the birds.

FORRESTER ISLAND, ALASKA.—The number of birds on this reservation was about the same as in 1914, except that an additional colony of Cassin auklets was found which was not noted last season, and forked-tailed petrels were apparently less plentiful. The warden reported that fishing during the season of 1915 showed a decided improvement over that of the previous year, although the number of fishermen on the reservation was much smaller, only about 180 permits being issued as against more than 500 during 1914. Several hard wind storms visited the island, one particularly severe, on July 5-6, doing considerable damage to the boats.

HAWAIIAN ISLANDS.—On September 25, 1915, the American schooner *O. M. Kellogg*, bound for San Francisco from a point in the South Pacific went ashore on Maro Reef, not far distant from Laysan Island, and the captain and his crew made their way safely to that island, where by chance they found Capt. Max Schlemmer with two companions, who had landed a short time before. With the aid of Capt. Schlemmer's yacht *Helene* the crew of the *O. M. Kellogg* reached Midway Island, and were safely transferred to Honolulu by a naval tug. Subsequently, the U. S. S. *Nereus* returning from Japan stopped at Laysan and brought back Capt. Schlemmer and his two companions.

During the last cruise of inspection of the Coast Guard cutter *Thetis* in March and April, 1915, a landing was made on Nihoa, or Bird Island. This precipitous rock rises to a height of some 500 feet above the sea and has remained one of the most inaccessible islands in the reservation. Among the interesting birds found was a finch supposed to be related to the species which occurs on Laysan. On Laysanski Island no vegetation was left and all the rabbits which had been introduced some years ago had disappeared, evidently showing that the rabbits had eaten all the vegetation and had then perished through lack of food. There was no evidence that the birds had been disturbed by poachers. On Laysan Island there was a marked improvement in the condition of the birds over that of the previous year. Many more albatrosses were found breeding, thousands of the Hawaiian terns were nesting, and 35 of the rare Hawaiian teal were seen, more than twice as many as were previously reported.

IMPORTATION OF BIRDS AND MAMMALS.

Continuance of the war in Europe has had an even more noticeable effect on the importation of birds and mammals than during

the previous year. Only 411 permits were issued as compared with 454 in 1915. Inspections during the year numbered 163, as compared with 150 in 1915, and 188,117 birds and 3,149 mammals were imported under permit. Among these were 127,706 canaries, 11,547 miscellaneous game birds, and 41,626 nongame birds. Besides these, 44,827 birds and 312 mammals requiring no permits were admitted to entry. No cases of entry of prohibited species were discovered during the year.

War conditions are responsible for the almost total absence of European partridges and for the small number of pheasants in the shipments this year, and even the importation of the latter birds from Canada shows a noticeable falling off. On the other hand, there has been a remarkable increase in the number of permits for the entry of foxes from the Maritime Provinces of Canada, due to the unusual interest in fox farming in the United States. There has also been a falling off in the importation of parrots from Mexico.

Notwithstanding the difficulty of obtaining stock through the usual channels, the principal zoological gardens have secured a number of rare and interesting species, some of which have been placed on exhibition in the United States during the past year for the first time. Among these may be mentioned the red bird of paradise and the tiny Wilson bird of paradise, natives of the Island of Waigiu, near New Guinea. A pair of each of these rare birds, the first ever brought alive to the United States, reached New York, December 27, 1915, for the New York Zoological Park. That park also received a pair of the rare greater bird of paradise (*Paradisea apoda*), two young giant herons (*Ardea goliath*) from Africa, and a cock of the rock (*Rupicola rupicola*) from Guiana.

IMPORTATION OF QUAIL FROM MEXICO.—The issue of permits for the importation of quail from Mexico was resumed in the autumn under formal regulations for the entry of the birds, promulgated November 1, 1915. The port of entry on the Rio Grande was changed from Brownsville to Eagle Pass, Tex., and, as heretofore, birds imported by steamer were entered at New York. Through cooperation with the Bureau of Animal Industry, actual inspection and quarantine were carried out under the supervision of the inspectors of that bureau at the ports of Eagle Pass and New York. Practically every shipment which arrived at New York was infected with quail disease. Many birds died en route or shortly after arrival and very few survived the period of quarantine. Quail disease was also detected in a shipment at Eagle Pass, and on January 22, 1916, further importations were suspended. As a result the total number of birds for which permits were issued was 12,989; of these only about 8,000 were actually imported.

Reports of the death of some of the birds which survived quarantine led to investigation of the cause of such loss, and examination of specimens sent to the department showed the presence of bird pox (*Epithelioma contagiosum*), a disease common in poultry, but one which seems this year to have caused serious loss among imported quail for the first time. Many of the birds affected seemed to have been injured in transit and it is possible that the prevalence of the malady this year was due to the type of crates used by shippers.

Before next season a public hearing will be held at which shippers and others interested in the importation of quail will exchange views and aid the department in formulating revised regulations to prevent the introduction of birds affected either with quail disease or bird pox.

INFORMATION CONCERNING GAME LAWS.

The game laws of the various States for the year have been carded, thus keeping up to date the index of game legislation. Owing to the demand for information on certain topics of game legislation, work on a subject index has been actively prosecuted and memoranda on some of the more important phases prepared. This index will be compiled as rapidly as time permits. The regular annual publications, including a directory of game officials, the sixteenth annual summary of game laws, a general poster showing open seasons for game, and a local poster showing open seasons for North Carolina, where there are many laws applying to particular counties, were issued and widely distributed. Sets of ready-reference card maps illustrating in condensed form five topics of game legislation of special interest to various State game officials also were published.

INTERSTATE COMMERCE IN GAME.

Illegal exportations of game from various States, involving violations of sections 242, 243, and 244 of the Criminal Code of the United States, known as the Lacey Act, are becoming fewer with a more rigid enforcement of the Federal law under a reorganization of the force which went into effect March 1, 1916. Three inspectors are now employed, having their headquarters accessible to points where illegal shipments have been most frequent. Forty-five cases have been reported to the solicitor's office during the year, 18 of these since March 1. The cases involved violations in 19 States. Game illegally shipped consisted of partridges (ruffed grouse), wild ducks, reed birds, Carolina rails or soras, quail, squirrels, and deer. One shipment, comprising 1,162 pounds of venison, was made from Michigan, for which a fine of \$200 was imposed. Only 15 cases of violations remain on file for investigation, but this number does not include cases in hands of inspectors but not yet reported.

Fifty-five cases, including some reported in the previous fiscal year, were disposed of by the Department of Justice, as follows: Thirty-four by conviction and the imposition of fines aggregating \$906 and jail sentences aggregating 103 days; 1 by directed verdict of not guilty; and 20 by dismissal for want of sufficient evidence, inability to identify defendant, or removal of defendant from the district.

With the practical termination of illegal shipping of wild waterfowl from the sunken-lands district in northeastern Arkansas, and with the special attention now being given the matter in the larger cities in the North, progress has been made in the conservation of wild game birds so far as illegal sale and shipment to market is concerned. Special attention will be directed to a few prominent cities in the South, where reports indicate that wild waterfowl are being illegally shipped during certain periods of the year.

FEDERAL MIGRATORY-BIRD LAW.

Pursuant to the provisions of the act of March 4, 1913, authorizing and directing the department to adopt suitable regulations prescribing and fixing closed seasons for migratory birds (37 Stat., 828, 847), regulations were prepared and promulgated October 1, 1913, and amended October 1, 1914. During the year the bureau has received a large number of petitions, requests, suggestions, and protests touching various regulations, chiefly urging longer open seasons and spring shooting. All have been given careful consideration, and many were embodied in proposed new regulations made public May 20, 1916. The law provides that a period of three months from that date shall be allowed in which these regulations may be examined and considered before new regulations may be finally adopted and submitted to the President for approval.

For administrative purposes the United States is divided into 13 districts now under the supervision of 16 inspectors. During the year the number of inspectors was reduced from 17 to 16, the commissions of 42 Federal wardens were terminated, and 43 new wardens were appointed, the present warden force numbering 195.

During the first year the regulations were in operation 17, and during the second year 12, cases were tried in district courts of Oregon, California, South Dakota, Nebraska, Kansas, Minnesota, Iowa, Michigan, Arkansas, and Louisiana, and all but 5 resulted in convictions and impositions of penalties. Fines were paid in 18 and suspended in 6 cases. In 4 cases demurrers and in 1 case motion in arrest of judgment were sustained. Twenty-five cases are now pending in district courts in various parts of the country, and 33 additional cases are ready to be submitted to the Department of Justice. In addition, 564 reports of violations have been forwarded to the bureau, but transmission of these to the Department of Justice is withheld pending decision of the United States Supreme Court in the case of United States against Harvey C. Shauver, involving the constitutionality of the law.

That the violations reported by no means approximate the number that have occurred is to be expected and is due to the impossibility in many cases under the law of securing evidence sufficient to convict. It is obvious that to patrol the shooting sections of the United States properly with 16 district inspectors is an impossibility, and the nominal salary paid Federal wardens justifies them in spending only a small portion of their time in the enforcement of the law. Possession of wild fowl during the closed season is not a violation under the Federal act, and there must be evidence of actual shooting or capture on which to base a prosecution. Furthermore, inspectors and wardens appointed under authority of the law have no power of arrest, and hence many violators escape.

As the activities of the inspectors have been confined mainly to "trouble zones," large sections have necessarily been left without supervision, but in such instances State authorities, cooperating with Federal wardens, have rendered efficient assistance. With a few notable exceptions, State legislatures have made progress in line with the Federal law and regulations.

Notwithstanding the difficulties attending enforcement, the law is very generally observed, and communications received from game

and fish commissioners and other persons contain incontrovertible evidence that since the law became effective there has been in most of the States a very marked increase in the number of wild fowl and shorebirds; that wild fowl have become unusually tame in spring; and that many thousands of waterfowl are breeding in certain localities where they had not nested for many years. The consensus of opinion attributes these greatly improved conditions to the abolition of spring shooting and the general observance of the regulations. These results following so soon after its enactment have proved the efficacy of the law and are an earnest of the results to come.